

IN THE CLAIMS

1. [currently amended] A method for handling dynamic state information used for handling data packets, which arrive at a network element node of a network element cluster, said network element cluster having at least two nodes and each node handling separate sets of data packets, said method comprising the step of:

- maintaining ~~(206)~~ in a first node a first, node-specific data structure ~~(557, 558, 559)~~ comprising entries representing state information ~~(520)~~ needed for handling sets of data packets handled in said first node, characterized in that said method further comprises

10 the step of:

- - maintaining ~~(208)~~ in said first node in addition to said node-specific data structure a second, common data structure ~~(554, 555, 556)~~ comprising at least entries representing state information ~~(520)~~ needed for handling sets of for data packets handled in at least one other node of said network element cluster, the contents of said common data structure effectively differing from the contents of said node-specific data structure and including copies of all state information entries maintained in a node-specific data structure of said at least one other node and needed for handling sets of data packets in said at least one other node, said entries being maintained according to information on how different sets of data packets are distributed among the nodes of the network element cluster,

- dynamically changing distribution of at least one set of data packets from said at least one other node to said first node the network element cluster, and providing said first node with respective changed distribution information,

- in response to said changed distribution information, selecting the state information entries of said at least one re-distributed set of data packets from said second common

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data structure and transferring them to said first node-specific data structure of said first node.

2. [currently amended] A method according to claim 1, ~~characterized in that it further comprises the steps of~~ further comprising:

- allocating ~~(200)~~ to each node belonging to said network element cluster certain node-specific distribution identifiers, each node having separate node-specific distribution identifiers allocated to it,

- handling at least a plurality of data packets so that a data packet is handled ~~(204)~~ in that node of said network element cluster, to which node a distribution identifier calculated ~~(202)~~ using certain field(s) of said data packet is allocated, and

- maintaining ~~(212)~~ in a plurality of entries of said node-specific and common data structures distribution information ~~(510)~~ relating to the distribution identifier, which corresponds to the set of data packets related to the respective entry.

3. [currently amended] A method according to claim 2, ~~characterized in that it further comprises the steps of~~ further comprising:

- reallocating ~~(605, 606, 607)~~ said distribution identifiers to the nodes of said network element cluster,

- if said reallocation results in a new distribution identifier being allocated to a node, said new distribution identifier being a distribution identifier not allocated to said node at the time of the reallocation, identifying ~~(612)~~ in the common data structure of said node the entries corresponding to said new distribution identifier, and adding ~~(613)~~ said entries to the node-specific data structure of said node, and

- if said reallocation results in an old distribution identifier not being allocated to a node anymore, said old distribution identifier being a distribution identifier allocated to said node at the time of the reallocation, identifying ~~(615)~~ in the node-specific data structure of said node the entries corresponding to said old distribution identifier, and clearing
5 ~~(616)~~ said entries from the node-specific data structure of said node.

4. [currently amended] A method according to claim 2, ~~characterized in that it further comprises the steps of~~ further comprising:

- adding ~~(400)~~ a new entry to said node-specific data structure in a first node,
- communicating ~~(402)~~ said new entry at least to a second node of the network element
10 cluster, and

- adding ~~(403)~~ an entry corresponding to said new entry to the common data structure of said second node.

5. [currently amended] A method according to claim 4, ~~characterized in that it further comprises the step of~~ further comprising:

15 - adding ~~(401)~~ an entry corresponding to said new entry to the common data structure of said first node.

6. [currently amended] A method according to claim 1, ~~characterized in further comprising~~ maintaining ~~(210)~~ in said common data structure of said node entries representing state information needed for handling sets of data packets handled in said
20 node.

7. [currently amended] A method according to claim 1, ~~characterized in that wherein~~ said state information comprises the source address field ~~(521a)~~ and/or the destination address field ~~(521b)~~ of an Internet Protocol header, and/or port header fields ~~(522a,~~

~~522b)~~ of a Transmission Control Protocol header and/or port header fields ~~(522a, 522b)~~ of a User Datagram Protocol header, and/or the identifier header field of an Internet Control Message Protocol header, and/or a Message Identifier field ~~(524)~~ of an Internet Security Association and Key Management Protocol header, and/or an Initiator Cookie field ~~(525)~~ of an Internet Security Association and Key Management Protocol header, and/or the Security Parameter Index field ~~(523)~~ of a security header relating to the IPSec protocol suite, and/or a Session ID field ~~(526)~~ relating to the Secure Sockets Layer protocol, and/or an HTTP Cookie field ~~(527)~~ relating to the HyperText Transfer Protocol.

8. [currently amended] A method according to claim 1, ~~characterized in that~~ wherein said state information comprises information ~~(528)~~ identifying an authenticated entity.

9. [currently amended] A method according to claim 1, ~~characterized in that~~ wherein said state information comprises information ~~(523)~~ identifying a secured tunnel, within which data packets of the corresponding set are tunneled.

10. [currently amended] A method according to claim 2, ~~characterized in that~~ wherein said distribution identifier is a hash value ~~(542)~~ and a hash function is used for calculating a hash value using certain field(s) of a data packet.

11. [currently amended] A method according to claim 2, ~~characterized in that~~ wherein said distribution information is said distribution identifier ~~(544)~~.

12. [currently amended] A method according to claim 2, ~~characterized in that~~ wherein said distribution information is information needed for calculating said distribution identifier for the corresponding data packet.

13. [currently amended] A method according to claim 2, ~~characterized in that~~ wherein said certain field(s) for calculating a distribution identifier comprise the source address field ~~(521a)~~ and/or the destination address field ~~(522b)~~ of an Internet Protocol header, and/or port header fields ~~(522a, 522b)~~ of a Transmission Control Protocol header and/or port header fields ~~(522a, 522b)~~ of a User Datagram Protocol header, and/or the identifier header field of an Internet Control Message Protocol header, and/or a Message Identifier field ~~(524)~~ of an Internet Security Association and Key Management Protocol header, and/or an Initiator Cookie field ~~(525)~~ of an Internet Security Association and Key Management Protocol header, and/or the Security Parameter Index field ~~(523)~~ of a security header relating to the IPSec protocol suite, and/or a Session ID field ~~(526)~~ relating to the Secure Sockets Layer protocol, and/or an HTTP Cookie field ~~(527)~~ relating to the HyperText Transfer Protocol.

14. [currently amended] A network element node ~~(700)~~ of a network element cluster having at least two nodes, said node ~~(700)~~ comprising

15 - first data storage means ~~(704)~~, and

- means ~~(702)~~ for maintaining in said first data storage means ~~(704)~~ a first, node-specific data structure ~~(551, 552, 553)~~ comprising entries representing state information ~~(520)~~ needed for handling sets of data packets handled in said node, ~~characterized in that said node further comprises:~~

20 - second data storage means ~~(708)~~, and

- means ~~(706)~~ for maintaining in said second data storage means ~~(708)~~ a second, common data structure ~~(554, 555, 556)~~ comprising at least entries representing state information ~~needed for handling sets of~~ for data packets handled in one other node of said network element cluster, the contents of said common data structure effectively

25 differing from the contents of said node-specific data structure and including copies of all

state information entries maintained in a node-specific data structure of said at least one other node and needed for handling sets of data packets in said at least one other node, and said entries being maintained according to information on how different sets of data packets are distributed among the nodes of the network element cluster.

5 - means for receiving changed distribution information dynamically changing distribution of at least one set of data packets from said at least one other node to said node in the network element cluster, and

- means that, based on said changed distribution information selects the state information entries of said at least one re-distributed set of data packets from said
 10 second common data structure in said second data storage and transfers them to said first node-specific data structure in said first data storage of said node.

15. [currently amended] A network element node ~~(700)~~ according to claim 14, ~~characterized in that~~ wherein:

~~- said means (702) for maintaining the node-specific data structure are adapted to add a~~
 15 ~~new entry to said node-specific data structure in said first storage means (704), and to communicate said new entry to said means (706) for maintaining common data structure,~~

~~- said means (706) for maintaining the common data structure are adapted to communicate said new entry at least to one other node of the network element cluster,~~
 20 ~~and in that~~

~~- said means (706) for maintaining the common data structure are further adapted to receive an entry from at least one other node of the network element cluster and to add an entry corresponding to said received entry to said common data structure in said second storage means (708).~~

16. [currently amended] A network element node ~~(700)~~ according to claim 15, ~~characterized in that~~ wherein:

- said means ~~(706)~~ for maintaining the common data structure are further adapted to add a new entry received from said means ~~(702)~~ for maintaining the node-specific data structure to said common data structure in said second storage means ~~(708)~~.

17. [currently amended] A network element node ~~(700)~~ according to claim 14, ~~characterized in that it further comprises~~ further comprising:

- means ~~(710)~~ for receiving distribution identifiers, which are currently allocated to said node, said distribution identifiers being used for handling at least a plurality of data packets so that a data packet is handled in that node of said network element cluster, to which node a distribution identifier calculated using certain field(s) of said data packet is allocated, and

- third data storage means ~~(712)~~ for storing said distribution identifiers, and ~~in that~~

- said means ~~(702, 706)~~ for maintaining the node-specific and common data structures are adapted to maintain in a plurality of entries of said node-specific and common data structures in said first and second data storage means ~~(704, 708)~~ distribution information relating to the distribution identifier, which corresponds to the set of data packets related to the respective entry.

18. [currently amended] A network element node according to claim 17, ~~characterized in that~~ wherein:

- said means ~~(710)~~ for receiving distribution identifiers are adapted to receive reallocated distribution identifiers, and

- said means ~~(706)~~ for maintaining the common data structure are adapted to detect a new distribution identifier being allocated to said node due to the reallocation, said new

distribution identifier being a distribution identifier not allocated to said node at the time of receiving reallocated distribution identifiers, and to identify in the common data structure the entries corresponding to said new distribution identifier, and to communicate said entries to said means (702) for maintaining the node-specific data structure for said

5 entries to be added to the node-specific data structure, and

- said means (702) for maintaining the node-specific data structure are adapted to detect an old distribution identifier not being anymore allocated to said node due to the reallocation, said old distribution identifier being a distribution identifier allocated to said node at the time of the reallocation, and to identify in the node-specific data structure the entries corresponding to said old distribution identifier, and to clear said entries from the
10 node-specific data structure.

19. [currently amended] A network element node (700) according to claim 14, characterized in that wherein said first data storage means (704) is a portion of kernel space memory.

15 20. [currently amended] A network element node (700) according to claim 14, characterized in that wherein said second data storage means (708) is a portion of user space memory.

21. [currently amended] A network element node (700) according to claim 14, characterized in that wherein said first data storage means (704) is a portion of content
20 addressable memory.

22. [currently amended] A network element node (700) according to claim 14, characterized in that wherein said first storage means (704) is a part of a cryptographic card.

23. [currently amended] A network element cluster (800) having at least two network element nodes (700), at least one of said nodes (700) comprising

- first data storage means (704), and

- means (702) for maintaining in said first storage means (704) a first, node-specific data

5 structure (551, 552, 553) comprising entries representing state information needed for handling sets of data packets handled in said node, ~~characterized in that said at least one node further comprises:~~

- second data storage means (708), and

- means (706) for maintaining in said second storage means (708) a second, common

10 data structure (554, 555, 556) comprising at least entries representing state information needed for handling sets of data packets handled in one other node of said network element cluster, the contents of said common data structure effectively differing from the contents of said node-specific data structure, and including copies of all state information

entries maintained in a node-specific data structure of said one other node and needed
15 for handling sets of data packets in said one other node, said entries being maintained according to information on how different sets of data packets are distributed among the nodes of the network element cluster,

- means for receiving changed distribution information dynamically changing distribution of at least one set of data packets from said one other node to said at least one node in

20 the network element cluster, and

- means that based on said changed distribution information selects the state information entries of said at least one re-distributed set of data packets from said second common data structure in said second data storage and transferring them to said first node-specific data structure in said first data storage means of said at least one node.

24. [currently amended] A network element cluster ~~(800)~~ according to claim 23, ~~characterized in that it further comprises~~ further comprising:

- means ~~(802)~~ for allocating to each node belonging to said network element cluster certain node-specific distribution identifiers, each node having separate node-specific distribution identifiers allocated to it, said distribution identifiers being used for handling at least a plurality of data packets so that a data packet is handled in that node of said network element cluster, to which node a distribution identifier calculated using certain field(s) of said data packet is allocated, and in that said at least one node further comprises:

- means ~~(710)~~ for receiving distribution identifiers, which are currently allocated to said node, and

- third data storage means ~~(712)~~ for storing said distribution identifiers, and ~~in that~~

- said means ~~(702, 706)~~ for maintaining the node-specific and common data structures are adapted to maintain in a plurality of entries of said node-specific and common data structures in said first and second data storage means ~~(704, 708)~~ distribution information relating to the distribution identifier, which corresponds to the set of data packets related to the respective entry.

25. [currently amended] A network element cluster ~~(9)~~ according to claim 24, ~~characterized in that~~ wherein:

- said means ~~(802)~~ for allocating distribution identifiers are adapted to reallocate distribution identifiers to the nodes of said network element cluster, and ~~in that in~~ wherein in said at least one node

- said means ~~(710)~~ for receiving distribution identifiers are adapted to receive reallocated distribution identifiers, and

- said means ~~(706)~~ for maintaining the common data structure are adapted to detect a new distribution identifier being allocated to said node due to the reallocation, said new distribution identifier being a distribution identifier not allocated to said node at the time of receiving reallocated distribution identifiers, and to identify in the common data structure the entries corresponding to said new distribution identifier, and to communicate said entries to said means ~~(702)~~ for maintaining the node-specific data structure for said entries to be added to the node-specific data structure, and

- said means ~~(702)~~ for maintaining the node-specific data structure are adapted to detect an old distribution identifier not being anymore allocated to said node due to the reallocation, said old distribution identifier being a distribution identifier allocated to said node at the time of the reallocation, and to identify in the node-specific data structure the entries corresponding to said old distribution identifier, and to clear said entries from the node-specific data structure.

26. [original] A computer program comprising program code for performing all the steps of Claim 1 when said program is run on a computer.

27. [original] A computer program product comprising program code means stored on a computer readable medium for performing the method of Claim 1 when said program product is run on a computer.